DOCUMENT RESUME

ED 479 551 IR 022 157

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TITLE EBOOK.EXE: A Desktop Authoring Tool for HURAA.

PUB DATE 2002-10-00

NOTE 7p.; In: E-Learn 2002 World Conference on E-Learning in Corporate, Government, Healthcare, & Higher Education. Proceedings (7th, Montreal, Quebec, Canada, October 15-19, 2002); see IR 022 093. Figures contain illegible type.

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PUB TYPE Reports - Descriptive (141) -- Speeches/Meeting Papers (150)

EDRS PRICE EDRS Price MF01 Plus Postage. PC Not Available from EDRS

DESCRIPTORS *Authoring Aids (Programming); Database Design; *Ethics; Information Policy; Information Technology; *Intelligent Tutoring Systems; Material Development; Research Methodology; Training

IDENTIFIERS *Research Ethics

ABSTRACT

The development of authoring tools for intelligent systems is an important step for creating, maintaining, and structuring content in a quick and easy manner. It has the benefit of allowing for a rapid change to new domains or topics for tutoring. The development of such tools requires functional control, access protection, ease of learning, and ease of use. This paper introduces the authoring tool created for the Human Use Regulatory Affairs Advisor (HURAA). HURAA is a Web-based help facility that provides training on the ethical use of human subjects in research, in addition to serving as an information retrieval system on ethical research policies. EBOOK.EXE is a general purpose database organization tool with special features that can be used for organizing curriculum scripts for intelligent tutoring systems. (Contains 13 references.) (Author)

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EBOOK.EXE: A Desktop Authoring Tool for HURAA

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Abstract: The development of authoring tools for intelligent systems is an important step for creating, maintaining, and structuring content in a quick and easy manner. It has the benefit of allowing for a rapid change to new domains or topics for tutoring. The development of such tools requires functional control, access protection, easy of learning, and ease of use. In this paper, we introduce the authoring tool we created for the Human Use Regulatory Affairs Advisor (HURAA). HURAA, is a web-based help facility that provides training on the ethical use of human subjects in research, in addition to serving as an information retrieval system on ethical research policies. EBOOK.EXE is a general purpose database organization tool with special features that can be used for organizing curriculum scripts for intelligent tutoring systems.

Introduction

HURAA is one of several projects currently conducted in the Institute for Intelligent Systems (IIS) in the University of Memphis. HURAA is designed for higher level military personnel to evaluate the ethical conduct of research using humans (Graesser, Hu, & Person, 2001). The content of HURAA is derived from Federal agency documents and regulations, particularly the National Institutes of Health (NIH, 45 CFR 46), the Department of Defense (32 CFR 219; DoD Directive 3216.2), and other particular policies from branches of the US military. The users of the HURA Advisor are high-ranking military officials who must approve research protocols involving human subjects in studies sponsored by the Department of Defense (DoD). These users focus on fundamental ethical issues, but not the detailed procedures and paper work associated with gaining approval from Institutional Review Boards. The purpose of HURAA is to allow users from the DoD to obtain important information, regulations, and guidelines in a short amount of time (less than 30 minutes) using the HURA Advisor.

Similar to most of web-based training systems, HURAA contains two major modules: Content and a Learning Management System (LMS). Content is the organized knowledge structure of the information to be delivered to the user. LMS, on the other hand, are a collection of server applications that manage the contents, monitor user-sever interactions and deliver appropriate information to the user. We will first briefly describe the contents of HURAA, and then we will introduce some key features of EBOOK.EXE. The LMS of HURAA has been described in previous papers and thus will not be discussed here (see Graesser, Hu, & Person, 2001).

HURAA

HURAA provides several learning trajectories to users. Within these learning trajectories, two types of learning activities are encouraged: (1) linear order browsing, namely, following scripts in a fixed order (e.g., Historical Overview and Lessons, as illustrated later) and (2) free style browsing of content with the

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aid of a semantic searching algorithm (e.g., Latent Semantic Analysis or LSA, see Landauer, Foltz, & Laham, 1998). The searching algorithm is a glorified search engine that uses semantic information to help the user obtain desired information from the database. Using these types of learning, HURAA is used to aid users in obtain important information, regulations, and guidelines they need in a short amount of time (less than 30 minutes) to make decisions on ethical human subject research. To make this possible, HURAA tries to help users make connections between major ethical issues and specific cases. That is, the users attempt to identify what ethical issues are problematic for any particular experiment (case). A theoretical case-issue matrix specifies what experts view as the problematic issues for particular cases. Additionally, HURAA houses a context sensitive FAQ function (Point & Query, Graesser, Langston, & Baggett, 1993) so users can ask questions at any point while they are using the system. HURAA makes available other information facilities that are convenient. For example, all glossary items are automatically highlighted throughout the system, so user can obtain definitions of any of the key items without switching to another interface or page.

EBOOK.EXE

EBOOK.EXE is a general-purpose database organization utility. It is written in Pascal and compiled using Delphi 6.0. System equipment and software needed to operate EBOOK is any modern version of Microsoft Windows™ (95/98/2000/XP). Another software requirement is an ADO connection to Microsoft SQL server database (however, it can be any ODBC compliant database locally, if there is no network connection). EBOOK.EXE organizes several database tables (data table for contents, data table Point and Query, Data table for LSA, data table for glossary, etc) with predefined field definitions. The user-interface of EBOOK.EXE is typical of any Windows™ desktop application (see Figure 1).

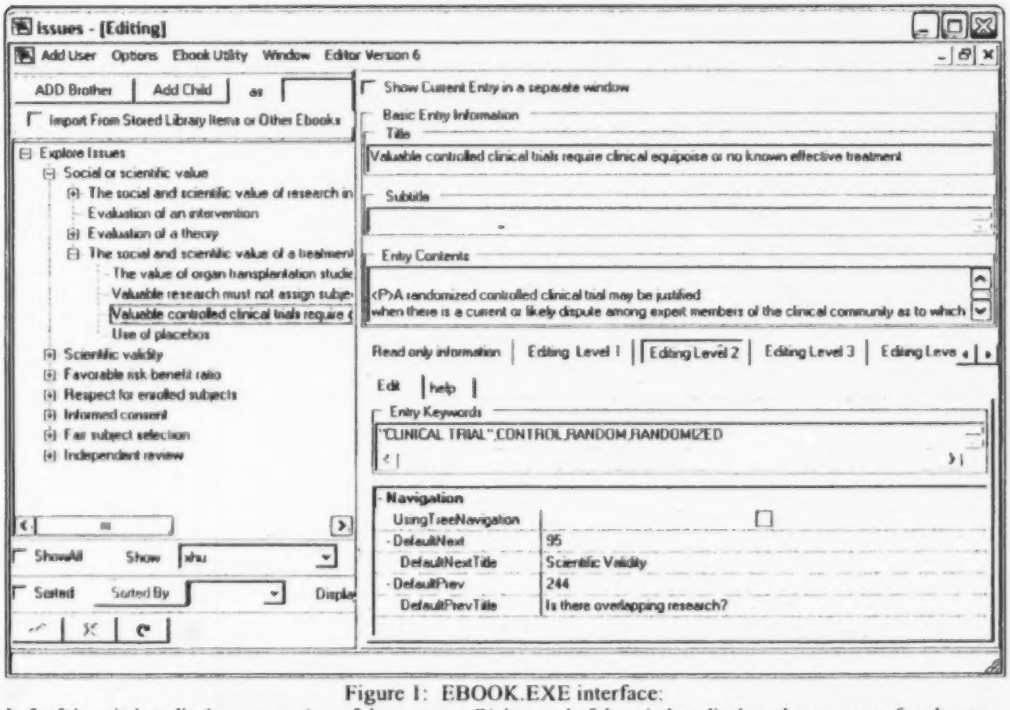

Figure 1: EBOOK.EXE interface:
Left of the window displays a tree view of the contents. Right panel of the window displays the property of each entry.

Organizing HURAA in EBOOK.EXE

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HURAA's contents are organized to emulate either the linear structure of an ordinary book (such as going through the Lessons on the system) or to allow the perusal of a hierarchical outline of knowledge on the topic (as is seen above in the Exploring Issues module). To accomplish this HURAA, uses a relational database with each entry containing several types information. (1) Visible elements, which include: a. text & multimedia, b. associated Point-and-Query items. c. talking head events (what animation will the talking head play, and what tip the talking head will give) and (2) logical elements, which include: a. type of entry (normal/display entry, question entry, multiple choice entry, feedback entry, etc); b. order information (such as which entry will be the default next to display).

According to Murray (1999), HURAA falls in to the new category of intelligent systems called Intelligent and Adaptive Hypermedia. This category is on the cutting edge of web-based media and as such takes strategies from both intelligent tutoring and hypermedia. Authoring tools developed for this category of systems are more difficult to create since they must adapt directly to the methodology used in building the system. Additionally, these types of systems make use of databases, control links, execute tutoring strategies, and adapt to the student, adding to the difficulty (see Murray 1999).

In the past desktop authoring tools have been developed that focus on insulating the user from the underlying architecture and programming of an intelligent system (Jordan, Rose, & VanLehn 2001). This left the user with little control of the structure of the learning, and limited the variety of delivery within these systems to predefined constraints. With EBOOK.EXE we wanted to abandon this type of approach and dramatically increase the control of the knowledge engineer. An advantage of such a desktop authoring tool is that it can offer more total control of the system because it takes advantages of windows user interface (such as drag and drop and variety of functional components). EBOOK.EXE is designed to use ADO and data-aware component in Delphi, so it transmits its data to the centralized server to make updates and changes simultaneously.

A description of useful features and limitations in EBOOK.EXE follows where we note our observations in authoring HURAA contents using the EBOOF.EXE authoring environment.

Graphic Interface

The most important advantage of a desktop application is the capability of using the Microsoft Windows™ graphic interface with which most users are familiar. Building upon this interface, EBOOK.EXE exploits several visual components that make it possible to display the structure of the content organization in a simple and easy to comprehend manner. A graphic tree overview of the contents and its structure allows the user to navigate through the entire course within the interface, as shown in Figure 1.

We used the tree view to display the organized knowledge, allowing authors to concentrate on the contents, and not the html code. In fact, this authoring tool does not require any knowledge of HTML coding. The database organizes the information, and the server application produces the final web pages from the database (using HTML and XML) that reflects hierarchical structure of the content. For example, the hierarchical tree structure corresponds identically to the organization of the material into Modules, Issues, Topics, and Points as is seen in Figure 2.

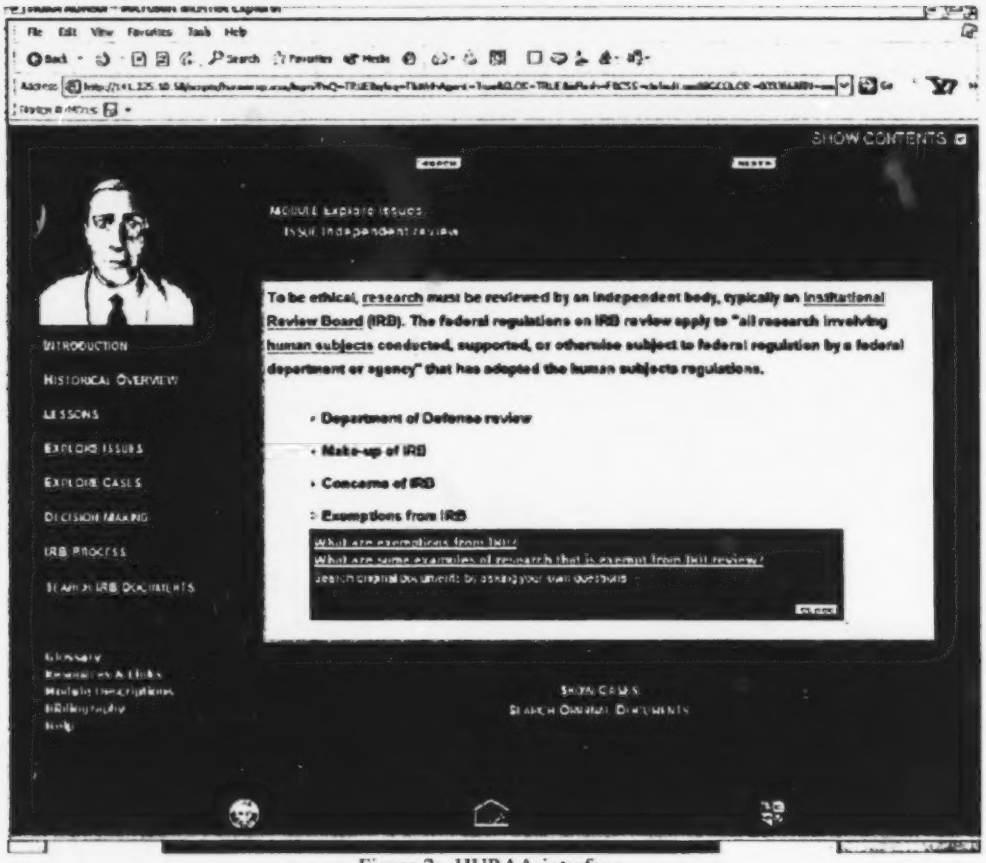
SHOW CONTENTS
To be ethical, research must be reviewed by an independent body, typically an Institutional Review Board (IRB). The federal regulations on IRB review apply to "all research involving human subjects conducted, supported, or otherwise subject to federal regulation by a federal department or agency" that has adopted the human subjects regulations.
• Department of Defense review
• Make-up of IRB
• Concerns of IRB
• Exemptions from IRB
INTRODUCTION
HISTORICAL OVERVIEW
LESSONS
EXPLORE ISSUES
EXPLORE CASES
DECISION MAKING
IRB PROCESS

Figure 2: HURAA interface.

The authoring tool allows the user to view/edit every aspect of each entry. If a special link needs to be displayed on a specific page, then it can be incorporated into the content with ease. If a deviation from the default display HTML is needed on a certain page of content, it can be explicitly marked up for that page only.

There are several other authoring tools for different intelligent systems. EBOOK.EXE tries to maximize the advantages of a windowing system, so it helps the user to concentrate on the content, not the format of the final deliverable web pages.

Different Levels of Editing

It has been pointed out that developing authoring tools for Intelligent and Adaptive Hypermedia (Murray, 1999) is difficult due to the complexity of the relations among the entries. For example, there are default learning trajectories that user needs to follow. There is also conditional branching that needs to be stored in the database. For every entry, there is other information associated, such as Point-and-Query (most frequently asked question for that entry only), search index (LSA vector, or keywords, etc), cross-links to entries in other data tables (such as case-issue matrix). It can certainly be overwhelming for inexperienced users, since they are only understandable to sophisticated trained users. EBOOK.EXE tries to allow for editing at different levels, so different users only concentrate on material that is relevant to certain editing level proficiencies. For example, content experts can concentrate on the logical relations of the content organization. Cognitive psychologists can make modifications on the interface (such as the talking-head scripts for the guiding of navigation), and computational linguistics experts can work on the

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LSA or other search indexes. It is in this manner that the complexity of the HURAA system can be distributed and comprehendible to users at various levels.

Import and Export

There are built-in utilities in EBOOK.EXE for importing and exporting the contents of the database into another format (such as another database, html, or XML). The content of HURAA is organized entirely in a database. As a result, it is relatively straightforward to convert the authored contents to other formats. EBOOK.EXE allows authors to export the entire data script to HTML. Most importantly, EBOOK.EXE has a built in conversion utility that exports the contents to XML metadata that is conformant with the Shareable Content Object Reference Model (SCORM). We use XSL to process the XML form of the content database. Currently, XSL for SCORM 1.2 is built-in. For future versions of SCORM, only minor modifications of the XSL files are need for the future versions of SCORM. Modification of the XSL files can be done using EBOOK.EXE or commercial packages such as XMLSpy (see http://www.xmlspy.com/).

Limitations

Most of the features on EBOOK.EXE are still at a functional level, and are not yet user-friendly. For example, EBOOK.EXE uses ADO to remotely connect to the data server on the network (or internet). This is a nontrivial step for users without knowledge of Windows™ database. In addition, the editing of talking-head event requires a special type of mark-up for Microsoft Agent™. And the converting utility to XML metadata for SCORM requires advanced knowledge in SCORM standards (http://www.adlnet.org). Due to these limitations, the current version of EBOOK.EXE is best used as in-house development tool. A future version of EBOOK.EXE is under development that focuses on usability by a variety of trained and untrained users.

Summary

Though we have shown the use of this particular desktop based authoring tool for the HURAA project, it should be noted that any content from any domain can be utilized within the system. The ability for the Learning Management System to deliver specific content rests solely within the authoring tool and its widespread functionality. Although the system we have set-up specializes in the delivery of government policies, procedures, and guidelines, we are confident that other domains can fit within the framework of both the LMS and the content script/database set-up by EBOOK.EXE

In this paper, we introduced an approach on how to develop and use EBOOK.EXE as an authoring environment for the web-based training system, HURAA. Presently, we have explored EBOOK.EXE, a desktop based authoring tool for use with HURAA, and explained some of the design considerations we took into account during our development evolution. While we do not claim our authoring environment is the definitive model for developing authoring tools, we assert that others can build upon these ideas in the development of their intelligent and authoring systems.

We introduced EBOOK.EXE as an authoring environment for adaptable hypermedia content as our solution these challenges associated in authoring the content. Since the LMS of HURAA allows for many learning paths as well as the option of allowing the user to explore the entire system, EBOOK.EXE needed a wide array of functionality and control over the content and its delivery. This led our design to be extremely functional to a finite set of users. Using this version of EBOOK.EXE, a variety of skilled users were able to organize and structure the content of HURAA. However, our future work on EBOOK.EXE will focus on increasing the usability of the system to make it accessible to unskilled users, as well as making attempts to make the authoring more web based.

Acknowledgements

This research was directly supported by contracts from the Office of Naval Research (N61339-01-C1006) and the Institute for Defense Analyses (AK-2-1801), and was partially supported from grants by the National Science Foundation (REC 0106965) and the DoD Multidisciplinary University Research Initiative (MURI) administered by ONR under grant N00014-00-1-0600. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of ONR, IDA or NSF.

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